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# ”JJCAB1#5 - Modelling of a resonant cavity with sonic black holes using patch transfer functions”

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Noise control in room acoustics is of paramount importance for the comfort of dwelling inhabitants, automobile passengers, and rail and aircraft pilots and passengers. The broadband dissipation of noise is a challenging task, especially at low frequencies, and many options have been proposed in the past decades. A relatively recent one is that of acoustic black holes (ABHs). An ABH is a passive and lightweight device for the control of noise and vibrations. It basically consists of a retarding wave guideline that slows down impinging waves and concentrates them at the ABH center, where energy gets dissipated by means of viscoelastic materials. Essentially, there are two types of ABHs: vibrational black holes (VBHs), which focus on the reduction of flexural waves in plates and beams; and sonic black holes (SBHs), which consist of specific duct terminations that dissipate propagating acoustic waves and avoid reflections. The present study focuses on SBHs, which have been less investigated than VBHs. In particular, the influence of an array of SBHs on the acoustic behavior of an acoustic room has not been assessed, while is of interest in many practical applications (buildings, automobiles, etc.). The acoustic field inside a SBH is complex, so building e.g., a finite element model (FEM) that considers a room with a wall of embedded SBHs is computationally prohibitive. Substructuring techniques can circumvent this problem. In the present work, we study the interaction between an array of SBHs and a rectangular acoustic cavity using the transfer matrix method (TMM) to characterize the SBHs and the patch transfer functions (PTF) approach to couple the SBHs to the acoustic cavity. A significant reduction in computational cost is observed with respect to FEM. The influence of various SBH design parameters on the cavity response can then be studied.

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